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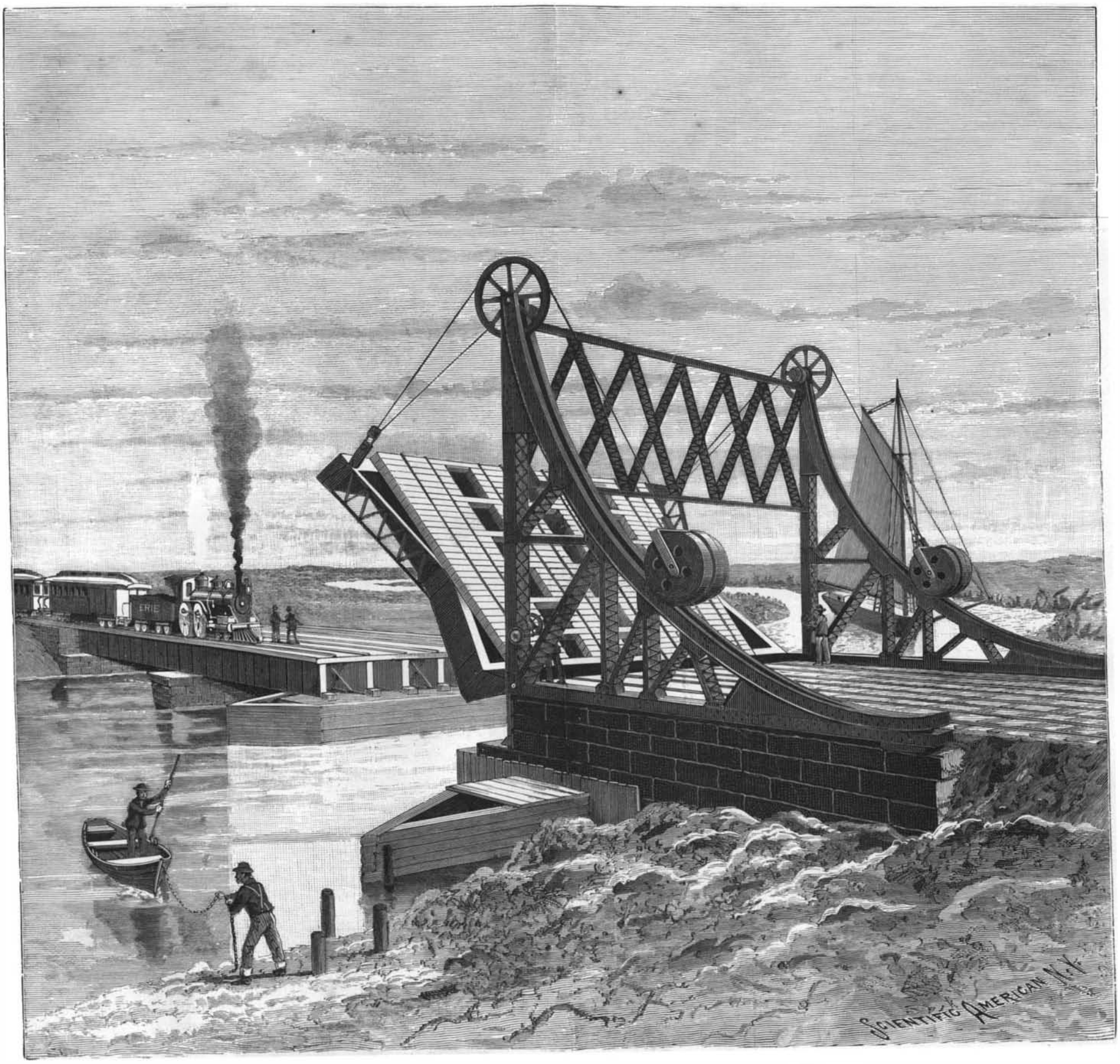
COUNTERWEIGHTED LIFT BRIDGE ON THE ERIE RAILROAD.

We present in this issue a perspective view of a counterweighted lift bridge which has recently been opened across Berry's Creek, near Rutherford, N. J., on the main line of the Erie Railroad. Although the principle upon which the bridge is constructed is not entirely new, the Berry Creek bridge is the first application of this system of counterweighting to a structure of this magnitude. The crossing consists of two fixed spans 50 feet long and a draw span 32 feet long, center to center of bearings. The whole structure is four-tracked, and on account of the great width (44 feet center to center of outside girders) as compared with its length of 32 feet, it was deemed advisable to lift the draw rather than turn it. The draw itself consists of four spans of ordinary deck plate girders, one beneath each rail. The spans are framed as stringers to a header girder at each end, and they are so braced together that when the draw is raised the header girders form the chords of a deep truss, and are, therefore, subject to direct tension and compression, the shear being carried to the end stringers by the bracing. The hoist ropes are attached to the ends of the outer header girder, as are also the counterweight ropes, any bending moment that is caused by the pull of these ropes being resisted by the latticed struts shown at the sides of the draw. The hinges are located at the ends of the shore girder, and the reaction when the bridge is raised is transferred to them by struts similar to those above mentioned, except that they are made of plates and angles.

The bridge is balanced by means of weights rolling upon tracks, which are so curved that the work done by the weights in dropping from one position to another equals the work to be done in raising the bridge to a corresponding position. It will be evident to our readers that if the counterweights were permitted to fall vertically, the bridge would be raised at an accelerating speed, and would be brought up violently against the vertical posts of the counterweight frame; and this, for the reason that, while the pull on the counterweight end of the rope would be constant, the pull of the bridge as it was raised would constantly decrease, the weight being taken by the hinges.

To compensate for the decreasing load of the bridge, the counterweights are run out upon a curved track, the curve being so regulated that the counterweight and the bridge shall be almost in equilibrium at any position. The weights, however, are made less than the weight of the draw span, the difference being that which closes the draw.

The office of the hoist ropes above mentioned is to lift this difference of weight. They run over 23 inch sheaves at the top, and down to winches at the bottom of the posts, which are arranged to work by hand power. These sheaves are connected at the top by a shaft and gearing, so as to insure that the men on either side will work evenly. The counterweights, each of which weighs about 25 tons, consist of two sets of



COUNTERWEIGHTED LIFT BRIDGE ON THE ERIE RAILROAD, NEAR RUTHERFORD N. J.

nine cast iron disks, 6 feet in diameter, which are solid except for four holes in which cast iron adjustment weights can be placed for regulating the load. The counterweights run upon tracks which are built of two 15 inch channel beams spaced 20 inches apart, the tracks being braced to the posts and the bottom member by means of lattice struts and ties as shown in the illustration. The two frames are kept in line by the latticed portal, which is 16 feet deep. The inshore end of each counterweight frame is anchored down to the foundation masonry by two 1¾ inch bolts. The hoist ropes are $\frac{9}{16}$ of an inch and the counterweight ropes 1¾ inches in diameter; the latter consisting of six strands of nineteen wires wound around a hemp center. The total weight of the draw span is 138,120 pounds, and the counterweights can be so nicely adjusted, if it were desired, that one man could open and shut it in three or four minutes. The structure was built by the Union Bridge Company, of New York City, under the direction of C. W. Buchholz, chief engineer of the Erie Railroad, to whom we are indebted for the above particulars.

Transmission of Power from Niagara Falls to Buffalo Completed.

Immediately after midnight, in the early hours of Monday, November 16, the Niagara Falls Power Company made its first transmission of electric power from Niagara to Buffalo, when a current of 1,000 horse power was delivered at the station of the Buffalo Railway Company. The occasion is notable as being the first practical example of the much talked of "harnessing of Niagara" for transmission of its mighty water power to a distance. Upon the commercial success of the Buffalo venture will depend the more extensive transmission of this vast storehouse of natural energy to the various manufacturing centers that lie at a greater distance. It was on March 31, 1886, that the Niagara Falls Power Company was incorporated. The Construction Company was organized in 1889, and work was begun on October 4 of the following year. It took three years to build the tunnel, the surface canal and the first wheel pits. The canal, 250 feet wide, with an average depth of 12 feet, draws off sufficient water from the Niagara River, a mile and a quarter above the falls, to serve for the development of 100,000 horse power. The walls of the canal are pierced at intervals with ten inlets for the delivery of water to the wheel pit in the power house, which stands at the side of the canal. The pit is 178 feet deep and connects by a lateral tunnel with the main back to the river below the falls. The tunnel, which has a maximum height of 21 feet and width of 18 feet 10 inches, was a large undertaking, involving the labor for over three years of 1,000 men, the excavation of over 300,000 tons of rock, and the use of 16,000,000 bricks for lining.

In view of the unprecedented nature of the undertaking, it was decided to throw the matter of designing the electrical plant open to international competition, and two prizes were offered "for the most efficient method of converting falling water into rotary motion and of transmitting the rotary motion or power to a greater or less distance." The turbines were built after the accepted designs of Messrs. Faesch & Piccard, of Geneva, Switzerland. They work under a head of 140 feet and each develops 5,000 horse power. After a careful investigation of the power transmission plants of the world, the International Niagara Commission adopted a two-phase alternating electric generator of 5,000 horse power, developing about 2,000 volts. The first installation consists of three generators, designed by the company's electrical engineer, Prof. George Forbes, of London, and built by the Westinghouse Company. The weight of each generator is 170,000 pounds. A fully illustrated description of this plant appeared in our issue of January 25 of this year.

The first distribution of power was made to the works of the Pittsburg Reduction Company, adjacent to the canal, in August, 1895. Other and later users of the power have been the Carborundum Company, the Calcium Company, the Buffalo & Niagara Railway Company and the Niagara Falls Electric Lighting Company.

In December, 1895, the city of Buffalo granted a franchise to the company to supply power to that city, under the terms of which it must be prepared to furnish 10,000 horse power to consumers by June 1, 1896, and 10,000 additional horse power in each successive year. The first customer under this arrangement was the Buffalo Railway Company, which arranged to take 1,000 horsepower, at a rate of $36 per horse power per year. The current is transmitted by a pole line, consisting of three continuous cables of uninsulated copper, the total length of which is 78 miles.

To meet the future demand, the Niagara Falls Power Company is preparing to install seven more generators of 5,000 horse power each, which will be exactly similar to those already in place. When the necessary extensions have been made, the pit will be 430 feet long and 185 feet deep, and the total capacity of the plant will be 50,000 horse power, or one-half of the capacity of the canal.

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1091.

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THE LOTTERY SYSTEM AS APPLIED TO PATENT PRACTICE.

We publish on another page an abstract of a paper read by Mr. Albert Scheible before the Chicago Electrical Association. In it the subject of patents is considered from the ethical and practical standpoint, and the conclusions reached by the author are at once conservative and just. The article is most timely, for in this country the need of a reform of patent practices in certain directions was never more urgent than now.

Two or three factors underlie the relation of inventor and patent attorney, factors similar to many which are discernible in other relations of life. The inventor requires good service; his work must be executed up to the highest standard, and such work has to be paid for. Any system which purports to give such service for other than adequate compensation, by that fact makes itself an object of suspicion. Impartiality must characterize the solicitor's work. No human being can pronounce upon the merits of an untried device, and the attorney, among the many subjects for patents which are placed in his hands, must have no favorites.

The attorney, therefore, must hold a definite business relation to the inventor and the latter must feel that he is getting in the services of a thoroughly competent solicitor the best value for his expenditure of thought, time and money. His view of the case eliminates side issues. Flattery of the inventor and the skillful raising of his expectations, touching his vanity and his desire of pecuniary returns by specious promises, should not form part of the transactions.

Unfortunately, the hard working necessarily imaginative inventor has long been a subject for attack by a class of patent attorneys who apply all the methods of commercial life to getting money out of him. They will give no honest opinion as to the possible patentability of a device, because their first and only thought concerns their fees. These can only be earned by bringing the case before the Patent Office, and any doubts on the part of the inventor must be overcome by persuasion. He must be made immediate use of, and his invention is mature, from the standpoint of the unprofessional solicitor, as soon as it can be enticed into the office to yield a return in fees.

Every now and then a peculiarly flagrant example of unprofessional practice comes to the surface and seems to cast a shadow on the whole profession.

Thus a firm of patent solicitors may convert their business into a lottery system, and undertake to persuade inventors to submit themselves and their inventions to a chance competition. A system of prize awards for assumed meritorious invention, a system including cash awards and silver medals, incredible as it may seem, has actually been inaugurated by a concern of patent solicitors. Periodically the cash prize is given for the "most meritorious and simplest invention."

Only one inventor gets the prize, and for the consolation of his less fortunate brethren silver medals are issued galore. These medals are cheap affairs, but they are calculated to tickle the vanity of the thoughtless.

Should such an institution as the Franklin Institute, of Philadelphia, the American Institute, of New York, or other association of that character issue medals for real merit, there would be some discernible raison d'être. The impartiality of the judgment and the purity of the motives underlying the establishment of such a competition would be evident, as there would be no oblique motive discernible. But in the case we cite, it is a firm of private patent solicitors who, in order to boom their own business, offer these prizes, which are paid for indirectly by the inventor.

The value and significance of the award, even of the grand prize, may, however, be gaged by the fact that it happens that, in spite of the strenuous efforts of these attorneys to prevent such a result, the invention for which the prize was awarded is rejected at times by the Patent Office, and the patent refused.

The motives of the system are so clear that little sympathy seems due those who suffer by it.

The reduction of the profession of patent attorney to the low grade marked by this lottery system is to be greatly deplored. The cheap medals and insignificant cash prizes, the publishing of portraits of the victims in a cheap journal, under the same control, are simply "chromos," with which to attract customers. They combine patent soliciting with alleged patent selling and promoting, and sugar the whole with foolish awards.

The evils of such practice are great. The inventor has always been at a disadvantage in the business world, as his habits of thought, as set forth in the lecture above referred to, are not always those requisite for pecuniary success. The methods we have described are adapted simply to lead him on by appealing to the gambler's spirit in human nature. What is the cure and how are practices such as those we have described to be prevented?

After an inventor has secured a patent his standing in the federal courts protects him, but his path to the Patent Office needs guarding. The establishment of a patent bar, long since and frequently advocated, would seem the least that should be done for the protection of inventors from men of the class we speak of. At